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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Hee Tae Jung

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INTELLECTUAL PROPERTY / TECHNOLOGY LAW

PO BOX 14329

RESEARCH TRIANGLE PARK, NC 27709

EXAMINER

GROSS, CHRISTOPHER M

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1639

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/805,044	Applicant(s) JUNG ET AL.	
	Examiner Christopher M. Gross	Art Unit 1639	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-31 is/are pending in the application.
- 4a) Of the above claim(s) 1-5, 12, 14-21, 27 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-11, 13, 22-26, 28, 30, 31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Responsive to communications entered 10/16/2007. Claims 1-5, 7-31 are pending. Claims 1-5, 12, 14-21, 27 and 29 are withdrawn. Claims 7-11, 13, 22-26, 28, 30, 31 are examined herein.

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/16/2007 has been entered.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Withdrawn Rejection(s)

The rejection of claims 7-11, 13, 22-26, 28 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement is hereby withdrawn in view of applicant's persuasive arguments and amendments to claim 22.

Maintained Claim Rejection(s) - 35 USC § 103

Claims 7-11, 13, 22-26, 30, 28, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Niu et al** (US Patent 6,872,681) in view of **Mamedov et al** (2002 Nature Materials 1:190-194).

Niu et al teach, throughout the document and especially the abstract and column 10, line 61 compositions comprising oxidized nanotubes with carboxylic acid groups as is set forth in claim 7.

Niu et al teach under 'Secondary Functionalization of Oxidized Nanotubes' bridging columns 10 and 11, the immobilization of proteins (elected species of claim

11), enzymes, oligonucleotides, etc, which is taken as the bio-receptor set forth in claim 8 and 31.

The proteins of Niu et al, absent evidence to the contrary, have amine groups capable of forming an amide bond with the carboxyl groups on the nanotube mentioned above, as set forth in claims 9-11, 22, 23, 25, 26 (elected species) as well as the bio-receptor coupled thereto of claim 31.

Niu et al teach in the table in column 11, diamines such as " $H_2N-R_1-NH_2$ " wherein R_1 is C_1-C_{20} saturated hydrocarbon (elected species) as set forth in claim 24 as well as aldehydes, hydroxyls, thiols and halogens as set forth in claims 22 and 23 for modifying the nanotubes.

Niu et al do not teach repetitive nanotube layers, such as set forth as the repeat step of claims 7(c) and 22(c)

Mamedov et al, throughout the document and especially page 191 second paragraph and page 193 first paragraph, a method of preparing nanotube films by sandwiching amide crosslinked carboxylated nanotubes between polyethyleneimine (PEI) and poly acrylic acid (PAA) to build up a surface layer by layer and is taken to meet all of the limitations set forth in claim 30.

It would have been *prima facie* obvious for one of ordinary skill in the art, at the time the claimed invention was made to apply the process of building up a nanotube film by sandwiching amide crosslinked carboxylated nanotubes between PEI and PAA per Mamedov et al, capping the top with the protein derivatized nanotubes of Niu et al.

One of ordinary skill in the art would have been motivated to use the process of building up a nanotube film by sandwiching amide crosslinked carboxylated nanotubes between PEI and PAA per Mamedov et al, capping with the protein derivatized nanotubes of Niu et al because it would prevent mechanical failure and phase separation, as noted by Mamedov et al in the abstract.

One of ordinary skill could use the process of building up a nanotube film by sandwiching carboxylated nanotubes between PEI and PAA per Mamedov et al, capping with the protein derivatized nanotubes of Niu et al with a reasonable expectation of success since Mamedov et al illustrate in figure 4, improved tensile strength of the PEI/PAA layered nanotubes as compared to a single layer and both references employ carboxylated nanotubes.

Please note this rejection clarifies and differs from the original in that claims 13 and 28 are now included because it is noted that claim 13 represents intended use of the CNT biochip set forth in claim 10 and claim 28 represents intended use of the CNT-biochip of claim 25. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Response to Arguments

Applicant argues (i) not all elements are taught; (ii) the carbon nanotube film of the present application provides surprising results.

Applicant's arguments have been fully considered but they are not deemed persuasive for the following reasons.

(i) Applicant specifically argues, see p 10 (10/16/2007) that the amendment to the preamble inserting "consisting essentially of laminated CNT layers" serves to differentiate the claimed subject matter from that of Niu in view of Mamedov based on MPEP 2111.03 which states "The transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. In re Herz, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976)

In this regard it is noted in claims 7 and 22 the lamination step is drawn to "reacting the CNT single layer or single layer pattern with an organic diamine to modify the CNT single layer **with organic amine groups** and reacting the organic amine groups with the **CNT having exposed carboxyl groups to laminate** a CNT layer thereon." Emphasis added.

It is noted that Mamedov et al teach on p 193, left column line 4, heat mediated amide bond formation between carboxylic acid containing CNTs and Polyethylenimine (PEI). Said PEI is taken as bearing organic amine groups as similarly forms a diamide with said carboxylic acid containing CNTs. Said heat mediated amide bond formation is taken as a type of lamination as it is noted Mamedov discuss subsequent delamination experiments on p 193, right column line 4.

Accordingly, MPEP 2111.03 continues "For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the

specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., PPG, 156 F.3d at 1355, 48USPQ2d at 1355

Here, there is no clear indication what the basic and novel characteristics are with regard to the lamination set forth in claims 7 and 22 as opposed to that presented by Mamdov et al, thus "consisting essentially of" remains construed as equivalent to "comprising."

(ii) Applicant specifically argues see p 11 (10/16/2007) that by modification of carboxyl groups directly on the CNTs to diamides eliminates the need for linearity improvement as well as the "chemical anchors" (i.e. PEI and poly acylic acid (PAA)) of Mamedov et al.

In so far as the presence of chemical anchors in the multilayer CNT film of Mamdov is concerned, it is noted that claims 7 and 22 use the transitional phrase "comprising" which is open to other elements, including PEI and PAA.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., lacking chemical anchors) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In so far as any linearity improvement of the claimed CNT films vs that of Mamdov et al, this is not found persuasive because the arguments of counsel cannot

take the place of evidence in the record. In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); In re Geisler, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997) ("An assertion of what seems to follow from common experience is just attorney argument and not the kind of factual evidence that is required to rebut a prima facie case of obviousness.") (see MPEP 2145 I.) In the instant case, Applicant's counsel argues CNT lamination with perhaps smaller diamines provides linearity similar to that of the Mamedov, however counsel does not provide objective evidence establishing this as a fact.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Gross whose telephone number is (571)272-4446. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, J. Douglas Schultz can be reached on 571 272-0763. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher M Gross
Examiner
Art Unit 1639

cg



MARK L. SHIBUYA
PRIMARY EXAMINER